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$$\begin{vmatrix} 1 & , 1 & , \dots 1 & , 1 \\ a_n & , a_{n-1} & , \dots a_2 & , a_1 \\ a_n^2 & , a_{n-1}^2 & , \dots a_2^2 & , a_1^2 \\ \vdots & \vdots & \vdots & \vdots \\ \vdots & \vdots & \vdots & \vdots \\ \vdots & \vdots & \vdots & \vdots \\ a_n^{n-2} & , a_{n-1}^{n-2} & , \dots a_2^{n-2} & , a_1^{n-2} \\ a_n^{n-2} & , a_{n-1}^{n-2} & , \dots a_2^{n-2} & , a_1^{n-2} \end{vmatrix}$$

which is identically $= 0$, because the last two rows are identical. Hence the solution of the problem is given by (1), the coefficients being determined by (9).

It is a remarkable result of this solution that the value of the fraction $x_n \div a_n$, or ratio of the wine to the whole contents of the last cask, is wholly independent of the order of the casks.

NOTE ON A FORM OF THE EQ. OF THE TANG. TO A CONIC.

BY PROF. W. W. HENDRICKSON, U. S. NAVAL ACADEMY.

THE envelope of any line $Aa^2 + Ba + C = 0$, where a is an arbitrary parameter, and A, B and C are functions of x and y, is $B^2 = 4AC$; it follows that if the equation to any conic be put in the form $B^2 = 4AC$, the equation to the tangent may be written either as $Aa^2 + Ba + C = 0$ or $Ca^2+Ba+A = 0$.

The equations to the conic sections and their tangents may be written as follows:

Circle, $y^2 = (a+x)(a-x)$, tangent, $(a-x)a^2+2ya+a+x = 0$.
Parabola, $y^2 = 4ax$, " $aa^2+ya+x = 0$.
Ellipse, $a^2y^2 = b^2(a+x)(a-x)$, " $b(a-x)a^2 + 2aya + b(a+x) = 0$.
Hyperb., $a^2b^2 = (bx+ay)(bx-ay)$, " $(bx-ay)a^2+2aba + bx + ay = 0$.

This form of the equation to the tangent will be found useful in certain problems of Analytical Geometry; thus, suppose it required to find the tangents to the conic

$$y^2-2xy+2x^2+8y+6x+49 = 0,$$

which pass through $(-14, -22)$. The equation may be put in the form $(y - x + 4)^2 + (x + 11)(x + 3) = 0$, and the equation to the tangent is $(x+11)a^2+2(y-x+4)a-x-3 = 0$; substituting the co-ordinates of the given point, we have $3a^2 + 8a - 11 = 0$, whence $a = 1$ or $-\frac{11}{3}$, and the equations to the required tangents are $y-x+8=0$, and $89x-33y+520=0$.